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Jorgensen, PJ; Ahmed, Marwa; Thomson, JR; Laemmler, Christoph; Bell, Jennifer; Alssahen, Mazen; Abdulmawjood, Amir; Frazer, Eilidh; Foster, G

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CASE REPORT

Food/farmed animals

# First porcine abortion associated with *Trueperella abortisuis* in the United Kingdom

**Pernille Knøs Jørgensen**[1] | **Marwa F. E. Ahmed**[2] | **Jill Thomson**[3] | **Christoph Lämmler**[4] | **Jennifer Bell**[3] | **Mazen Alssahen**[4] | **Amir Abdulmawjood**[5] | **Eilidh Fraser**[1] | **Geoffrey Foster**[6]

[1] Veterinary Services, SRUC, Aberdeen, UK

[2] Hygiene and Zoonoses Department, Faculty of Veterinary Medicine, Mansoura University, Mansoura, Egypt

[3] Veterinary Services, SRUC, Edinburgh, UK

[4] Institut für Hygiene und Infektionskrankheiten der Tiere, Justus-Liebig-Universität Gießen, Gießen, Germany

[5] Institute of Food Quality and Food Safety, University of Veterinary Medicine Hannover, Hannover, Germany

[6] Veterinary Services, SRUC, Inverness, UK

**Correspondence**
Pernille Knøs Jørgensen, Veterinary Services, SRUC, Aberdeen, AB219TB, UK.
Email: pernille.jorgensen@sruc.ac.uk

**Abstract**

The present study reports the isolation of *Trueperella abortisuis* from pooled foetal stomach contents of aborted swine foetuses from a single sow in North-East Scotland, United Kingdom. The organism was not isolated in purity; however a diagnosis of fetopathy due to *T. abortisuis* was made, due to predominant growth of the bacterium in addition to confirmative histopathological findings. As far as the authors are aware, this is the first report of the isolation of *T. abortisuis* from porcine abortion material in the United Kingdom.

**KEYWORDS**

abortion, disease investigation, microbiology, pathology, pigs

## BACKGROUND

*Trueperella abortisuis* (formerly known as *Arcanobacterium abortisuis*) was initially described by Azuma et al in 2009,[1] based on isolation of the bacterium from a placenta of a sow following abortion in Japan. Subsequently, the bacterium was isolated from pigs in Germany and the US.[2–5] Isolation from cats and a dog has also been reported.[6] We report the isolation of *T. abortisuis* from the stomach contents of aborted swine foetuses in the United Kingdom.

## CASE PRESENTATION

A 450-sow breeding herd in North-East Scotland with a weekly batch farrowing system reported four abortions within a 3-week period in April 2019. Replacement gilts were home-bred. Routine vaccination of adult breeding stock against *E. coli*, rotavirus, porcine circovirus type 2 and parvovirus was practised. Service was by AI only, with boars used as teasers. Five pig foetuses were submitted to Scotland's Rural College Veterinary Services Centre at Aberdeen for post-mortem examination and investigation. The dam was a 2-year-old sow, which aborted all her piglets on day 95 of the gestation period. The five foetuses were similar in size and weight, with a mean crown-rump-length and body weight of 23.6 cm and 660 grams, respectively. Meconium staining of the skin was evident in all foetuses, and the foetal stomach contents were viscous with clots and yellow in colour. The placentae were white in colour and diffusely thickened.

## INVESTIGATIONS

Tiny $\beta$-haemolytic colonies were isolated in a heavy predominant growth in a sample of pooled foetal stomach contents (P504054/19/1) from three of the foetuses randomly selected. Gram-positive diphtheroids were seen in a Gram stain of the colonies and characterisation by matrix assisted laser desorption ionisation time-of-flight mass spectrometry, API Coryne and a positive CAMP reaction with *Staphylococcus aureus* as indicator strain identified them as *Trueperellaabortisuis*. Molecular characterisation, including sequencing of 16S rRNA gene and 16S-23S rDNA intergenic spacer region further confirmed the identity of the strain as *T. abortisuis* (Figure 1).

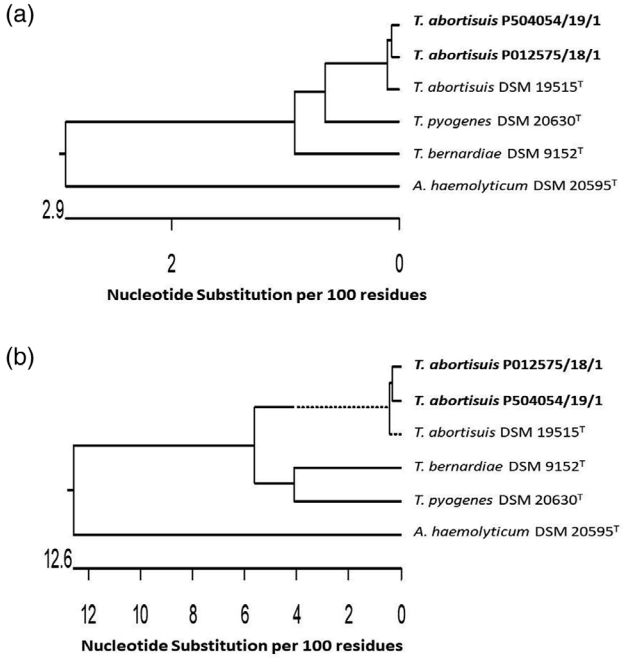


**FIGURE 1** Phylogenetic analysis based on nucleotide sequences of 16S rRNA gene (16S) (a) and 16S-23S rDNA intergenic spacer region (ISR) (b) of the investigated *T. abortisuis* P504054/19/1 isolated from aborted swine foetuses and *T. abortisuis* P012575/18/1 isolated from prepuce of a boar (unpublished data) compared with the type strains *T. abortisuis* DSM 19515$^T$, *T. pyogenes* DSM 20630$^T$, *T.bernardiae* DSM 9152$^T$ and *A. haemolyticum* DSM 20595$^T$

Culture of the placenta produced a heavy mixed growth including lactose-fermenting coliforms, an unidentified *Streptococcus* species and *Staphylococcus* species, which would likely have impeded the presence of any smaller and slower-growing colonies of *T. abortisuis*.

Histopathological examination of lung tissue from all five foetuses showed low-grade to moderate mixed inflammatory cell infiltrates with aggregates of mononuclear cells and neutrophils in bronchioles and alveolar spaces (Figure 2a), and some interstitial mononuclear cell infiltration. Gram-positive bacteria were present in bronchioles and alveolar spaces in association with inflammation (Figure 2b). Some bacteria were clearly diphtheroid in morphology, consistent with the isolation of *T. abortisuis*. Cellular debris and proteinaceous material were also present in bronchioles.

All four placentas showed acute placentitis. In three of the placentas, there were widespread exudative inflammatory changes associated with bacterial colonisation by numerous gram-positive bacteria (Figures 3, 4a and 4b). The placentae were oedematous with numerous neutrophil infiltrates. Necrosis and inflammation affected the placental villi, and there was inflammatory debris adjacent to the placental fronds. In the fourth placenta, the changes were mild and only present in small foci in the sections examined. Diphtheroids were not observed in the sections of placenta that were processed. The other foetal tissues examined (liver, kidney, heart and brain) were all within normal limits.

PCR testing for Porcine Parvovirus and PRRS was negative.

## DIFFERENTIAL DIAGNOSIS

Identification of the other bacteria isolated from placenta and foetal stomach contents was not further pursued at the time of investigation, as *T. abortisuis* was isolated in predominant culture from the latter.

**LEARNING POINTS/TAKE HOME MESSAGES**

- First report of porcine abortion associated with *Trueperella abortisuis* in the United Kingdom.
- *Trueperella abortisuis* appears to have an affinity to the reproductive and urinary tract of swine.
- The organism may cause sporadic abortions in swine.

## TREATMENT

There was no illness detected in the sow to prompt treatment for abortion.

## Outcome and follow-up

The stockperson reported a slight increased rate of return to service (not quantified further), and two cases of abortions occurred on farm following the initial investigation. The aborting sows had both been off feed at the time of abortion, and one was also lame. Laboratory investigation of one of these cases did not find evidence of infectious disease as a cause of abortion.

## DISCUSSION

*Trueperella abortisuis* was initially described by Azuma et al in 2009, based on isolation of the bacterium from a placenta of a sow following abortion.[1] A further paper based on nine strains collected over a 9-month period from the urogenital tract of pigs with varying clinical signs was published in 2011.[2] Four strains of *T. abortisuis* have also been isolated from an umbilical swab, two anal swabs and from a placenta after abortion from pigs in Germany,[3] and from a routine microbiological screening of extended boar semen in the United States.[4] Six different strains of *T. abortisuis* were further cultured over a 5-month period from porcine abortion material of a single farm in Germany.[5]

In the United Kingdom, *T. abortisuis* has not been reported; however, the organism has been isolated from the prepuce of a boar (P012575/18/1) kept in Midlothian, Central Scotland on a single occasion by Scotland's Rural College Veterinary Services (unpublished finding). In that case, the 7-month-old teaser boar was submitted for post-mortem examination after showing signs of malaise during transport and subsequently died. Gross and histopathological examination identified subacute systemic infection with *Erysipelothrix rhusiopathiae* as the cause of death. *Trueperella abortisuis* was isolated in moderate pure growth from a bloody exudate detected in the preputial diverticulum. Trauma to the prepuce was suspected as the boar fell while being unloaded and haematuria was present in the following days. Microscopic examination of the area was not undertaken as systemic erysipelas infection was recorded as the cause of death.

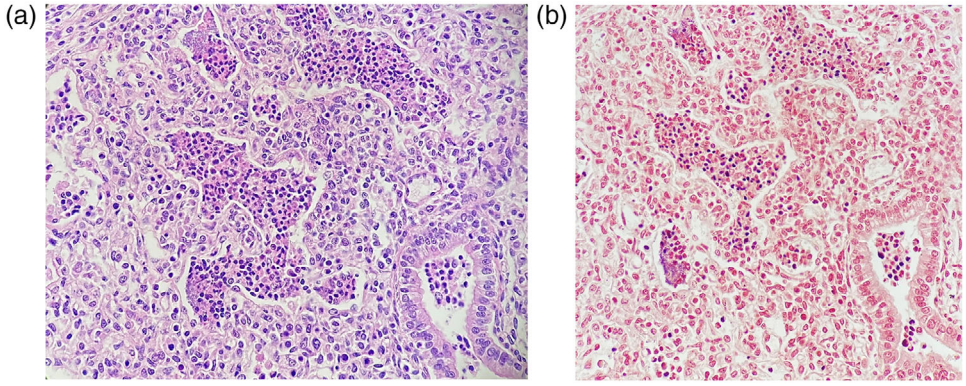


**FIGURE 2** Foetal lung (x400) showing mixed inflammatory cell infiltration in a bronchiole and in alveolar spaces associated with bacterial infection. Haematoxylin and eosin staining (a) and gram staining (b)

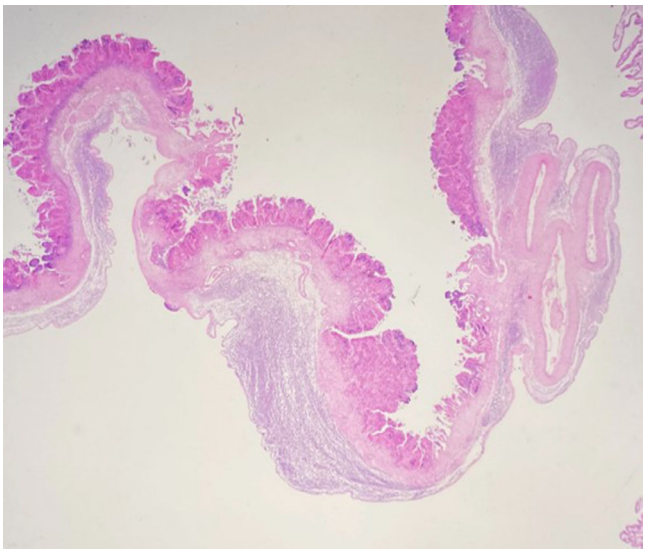

**FIGURE 3** Placenta (x40) showing widespread lesions of exudative placentitis. Haematoxylin and eosin staining

In many of the reported cases of *T. abortisuis* infection, the bacterium has been isolated from the reproductive or urinary tracts of pigs, and often in mixed growth with other bacteria,[2,5] as was also true for this submission. A diagnosis of fetopathy associated with *T. abortisuis* was made in this case, as the bacterium was isolated as the predominant organism within the pooled foetal stomach contents of three foetuses in addition to a histopathological finding of diphtheroid bacteria within inflammatory infiltrates in the bronchi and bronchioles in the piglets. Regrettably, final identification of the *Staphylococcus* and *Streptococcus* species was not undertaken at the time of submission; hence it is not possible to assess the significance of these organisms for the case.

The pathogenesis of infection is unclear, as the aborted dam was not examined or sampled at the time of abortion. Ascending infection, albeit relatively rare in swine, is possible, due to the apparent predilection sites of *T. abortisuis*, evident from the literature. The isolation of the organism from the prepuce of boars further supports a theory of potential passive transfer of the bacterium during natural mating. It was not possible to achieve information about any subsequent potential pregnancies in the sow to monitor whether infection with *T. abortisuis* had resolved or remained latent in the reproductive organs to affect future pregnancies.

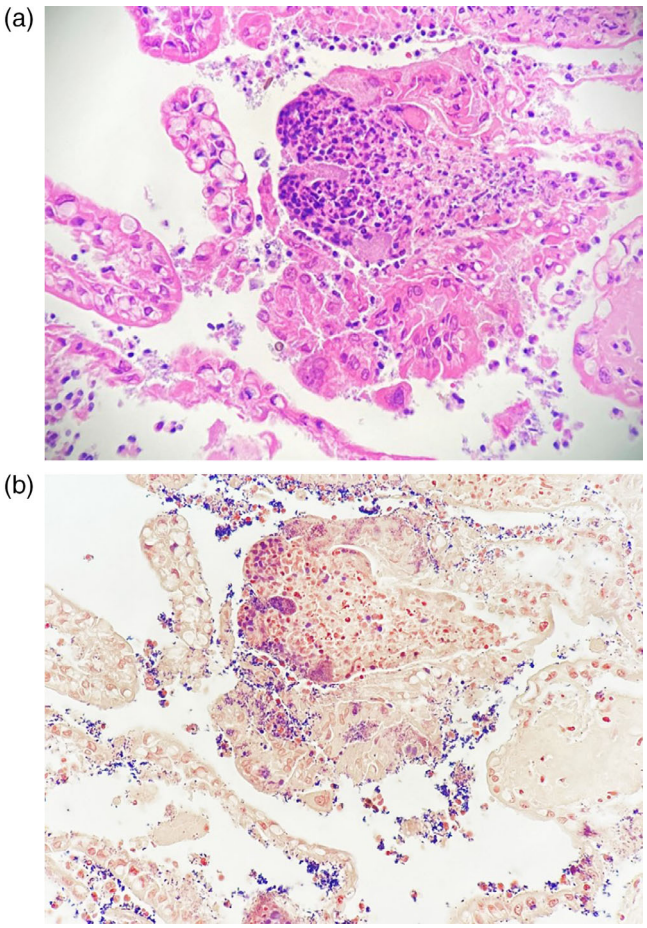


**FIGURE 4** Placental frond (x400) showing epithelial degeneration and mixed inflammatory cell infiltration associated with bacterial infection. Haematoxylin and eosin staining (a) and gram staining (b)

Further work is still required to determine the pathogenic importance of *T. abortisuis*; however this case illustrates the organism's involvement in occasional opportunistic abortions in swine. Other similar species within the genera *Trueperella* and *Arcanobacterium* have been reported to cause sporadic abortions in ruminants in the United Kingdom, including *Trueperella pyogenes* in cattle[7] and *Arcanobacterium pluranimalium* in sheep and cattle.[8,9]

This case illustrates the importance of a comprehensive sampling protocol in cases of porcine abortion: Aseptic collection of foetal stomach contents for culture in addition to sampling of a range of foetal tissues and placenta fixed in

formalin was invaluable for reaching a diagnosis in this sow. A definitive diagnosis could not have been confidently made with only either bacteriological findings or histopathological examination.

Accession numbers obtained for the *Trueperella abortisuis* sequences in this study have been deposited in Genbank as follows: 16S rRNA genes SUB8645792 = P021575/18/1, SUB8691244 = P504054/19/1; 16S-23S rDNA intergenic spacer region SUB8645888 = P012575/18/1 SUB8691250 = P504054/19/1, respectively.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

## ORCID

*Pernille Knøs Jørgensen* https://orcid.org/0000-0001-5967-0998

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